

## CLAIMS

The invention claimed is:

1. An improvement for the self-balancing shielded bipolar ionizer described in U.S. Patent 6,002,573, which currently includes

- a housing constructed of insulative material
- a recessed cavity (4),
- electrodes (7) placed within the recessed cavity (4), and
- a self-balanced high voltage power supply

whereas the improvement comprises

- a flow of air or nitrogen around each electrode (7)
- an air insert assembly which fits into the recessed cavity (4)
  - constructed of insulative material
  - with multiple concave external surfaces (10) to surround each electrode
  - with paths that distribute pressurized air or nitrogen to electrodes (7)
  - with holes (8) through which the electrodes protrude
- an air inlet fitting (3) to supply pressurized air or nitrogen, and
- electrode holders (13) that are compatible with both the air insert assembly and with high voltage connectors (5) .

2. The ionizer in claim 1 where the air insert assembly (2) comprises an air insert base (11) and an air insert cross (12).
3. The ionizer in claim 2 where the air insert cross (12) includes an integral port (16) that receives the pressurized air or nitrogen from air inlet fitting (3), ducts the pressurized air through a vertical bore or chamber (18) to the air delivery grooves or channels (19), and past the electrodes (7).
4. The ionizer in claim 1 where a first alternative air insert assembly is used, which comprises a solid curved surface (23) and a flat bottom cross (24).
5. The ionizer in claim 1 where another alternative air insert assembly (26) is used, which is a one-piece construction.
6. The ionizer in claim 2, 3, 4 or 5 where the air inlet fitting (3) and air insert assembly or insert cross form one part that receive air or nitrogen.
7. The ionizer in claims 1 or 5, where the air assist assembly is hermetically sealed into the recessed cavity (4) to minimize air leakage between the air assist assembly and the walls of the recessed cavity (4).

8. The ionizer in claims 1 or 5, where the floor of the recessed cavity (4) forms one boundary of the air delivery grooves (19).
9. The ionizer in claims 1,2,3, or 4 where the air insert assembly, the electrodes (7), and the electrode holders (13) constitute a removable subassembly.
10. The ionizer in claim 6 where the air insert assembly, the electrodes (7), and the electrode holders (13) constitute a removable subassembly.
11. The ionizer in claims 1,2,3,4, or 5 where each electrode tip (14) is situated in the focal point of its surrounding curved surface.
12. The ionizer in claim 6 where each electrode tip (14) is situated in the focal point of its surrounding curved surface.
13. The ionizer in claims 1,2,3,4, or 5 where the number of concave surfaces contained by the air assist assembly is equal to the number of electrodes (7).
14. The ionizer in claim 6 where the number of concave surfaces contained by the air assist assembly is equal to the number of electrodes (7).

15. The ionizer in claims 1,2,3,4, or 5 where the path to distribute pressurized air includes a vertical bore or chamber (18) as part of an air assist assembly.
16. The ionizer in claim 6 where the path to distribute pressurized air includes a vertical bore or chamber (18) as part of an air assist assembly.
17. The ionizer in claims 1,2,3,4, or 5 where the path to distribute pressurized air includes air delivery grooves or channels (19) of equal length connected to the vertical bore or chamber (18) through openings.
18. The ionizer in claim 17 where opening areas are not equal to each other.
19. The ionizer in claim 6 where the path to distribute pressurized air includes air delivery grooves or channels (19) of equal length connected to the vertical bore or chamber (18) through openings.
20. The ionizer in claim 19 where opening areas are not equal to each other.

21. The ionizer in claims 1,2,3,4, or 5 where air inlet fitting (3) penetrates the wall of the recessed cavity (4).
22. The ionizer in claim 6 where air inlet fitting (3) penetrates the wall of the recessed cavity (4).
23. The ionizer in claims 1,2,3,4, or 5 where ring gaps (20) are used to direct the pressurized air or nitrogen past the electrodes (7).
24. The ionizer in claim 6 where ring gaps (20) are used to direct the pressurized air or nitrogen past the electrodes (7).
25. The ionizer in claims 1,2,3,4, or 5 where pinholes (21) are used to direct the pressurized air or nitrogen past the electrodes (7).
26. The ionizer in claim 6 where pinholes (21) are used to direct the pressurized air or nitrogen past the electrodes (7).
27. The ionizer in claims 1,2,3,4, or 5 where toothed ring gaps (22) are used to direct the pressurized air or nitrogen past the electrodes (7).
28. The ionizer in claim 6 where toothed ring gaps (22) are used to direct the pressurized air or nitrogen past the electrodes (7).

29. The ionizer in claims 1,2,3, or 4 where electrodes (7) have sharp pointed tips (14) protruding through the exterior side of the air insert assembly, and electrode holders (13) protrude through the bottom portion of the air insert assembly into high voltage connectors (5) situated beneath the bottom of the recessed cavity (4).
30. The ionizer in claim 6 where electrodes (7) have sharp pointed tips (14) protruding through the exterior side of the air insert assembly, and electrode holders (13) protrude through the bottom portion of the air insert assembly into high voltage connectors (5) situated beneath the bottom of the recessed cavity (4).